

WHAT IS CLAIMED IS:

- 1 1. A method of forming a semiconductor device, the method comprising:
 - 2 providing a substrate having a gate electrode formed thereon;
 - 3 performing a first ion implant wherein the gate electrode acts as a mask;
 - 4 forming a first spacer on the substrate adjacent to the gate electrode;
 - 5 forming an etch stop layer on the substrate;
 - 6 forming a sacrificial spacer on the second etch stop layer on the substrate adjacent to the
 - 7 first spacer;
 - 8 performing a second ion implant wherein the sacrificial spacer and the first spacer acts as
 - 9 a mask;
 - 10 removing the sacrificial spacer; and
 - 11 performing a third ion implant wherein the first spacer acts as a mask.

- 1 2. The method of claim 1, wherein the step of forming the first spacer includes forming a
 - 2 dielectric liner on the substrate, forming a first spacer layer, and etching the first spacer layer
 - 3 wherein the dielectric liner acts as an etch stop.

- 1 3. The method of claim 2, wherein exposed portions of the dielectric liner are removed after
 - 2 forming the first spacer.

1 4. The method of claim 1, wherein the etch stop layer covers a shallow trench isolation.

1 5. The method of claim 1, wherein the third ion implant is performed before the second ion
2 implant.

1 6. The method of claim 1, wherein the first spacer comprises a material selected from the
2 group consisting of silicon nitride, silicon oxynitride, silicon oxime, a nitrogen containing
3 material, and a combination thereof.

1 7. The method of claim 1, wherein the etch stop layer is an oxide.

1 8. The method of claim 1, wherein the sacrificial spacer comprises a material selected from
2 the group consisting of silicon nitride, silicon oxynitride, silicon oxime, a nitrogen containing
3 material, and a combination thereof.

1 9. The method of claim 1, wherein the step of forming the sacrificial spacer includes
2 depositing a layer of Si₃N₄ and performing an anisotropic dry etch.

1 10. The method of claim 1, wherein the etch stop layer is an oxide formed by chemical vapor
2 deposition techniques.

- 1 11. The method of claim 1, wherein the step of removing the sacrificial layer is performed by
- 2 an etch process using a solution of phosphoric acid.

1 12. A method of forming a semiconductor device, the method comprising:

2 providing a substrate having a gate electrode and a shallow trench isolation (STI) formed

3 thereon;

4 forming a lightly doped drain in the substrate adjacent to the gate electrode;

5 forming a first spacer on the substrate adjacent to the gate electrode;

6 forming an etch stop layer on the substrate and over the STI;

7 forming a sacrificial spacer on the etch stop layer adjacent to the first spacer, the etch

8 stop layer preventing damage to the STI;

9 performing a second ion implant wherein the first spacer and the sacrificial spacer act as

10 a mask;

11 removing the sacrificial spacer, the etch stop layer preventing damage to the STI; and

12 performing a third ion implant wherein the first spacer acts as a mask.

1 13. The method of claim 12, wherein the step of forming the first spacer includes forming a

2 dielectric liner on the substrate, forming a first spacer layer, and etching the first spacer layer

3 wherein the dielectric liner acts as an etch stop.

1 14. The method of claim 13, wherein exposed portions of the dielectric liner are removed

2 after forming the first spacer.

1 15. The method of claim 12, wherein the third ion implant is performed before the second ion
2 implant.

1 16. The method of claim 12, wherein the step of forming the sacrificial spacer includes
2 forming a sacrificial layer and patterning the sacrificial layer to form the sacrificial spacer by
3 performing an anisotropic dry etch.

1 17. The method of claim 16, wherein the step of removing the sacrificial spacer is performed
2 using a solution of phosphoric acid.

1 18. The method of claim 12, wherein the sacrificial spacer comprises a material selected from
2 the group consisting of silicon nitride, silicon oxynitride, silicon oxime, a nitrogen containing
3 material, and a combination thereof.

1 19. The method of claim 12, wherein the second etch stop layer is an oxide.

1 20. The method of claim 19, wherein the oxide is formed by chemical vapor deposition
2 techniques.